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Appendix 7.1 Construction Vehicles Routing

7 Waste Management Implications

7.1 Legislation, Standards and Guidelines

7.1.1.1 The relevant legislation and associated guidance notes related to the study and assessment of waste management implications include:

- Waste Disposal Ordinance (WDO) (Cap. 354) and subsidiary Regulations;
- Environmental Impact Assessment Ordinance (EIAO) (Cap. 499), Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) Annex 7 and Annex 15;
- Land (Miscellaneous Provisions) Ordinance (Cap. 28);
- Public Health and Municipal Service Ordinance (Cap. 132) - Public Cleansing and Prevention of Nuisances Regulation; and
- Dumping at Sea Ordinance (DASO) (Cap. 466).

7.1.1.2 Under the Waste Disposal Ordinance, some of the regulations are relevant to EIA, including:

- Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C); and
- Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 354N).

7.1.2 Waste Disposal Ordinance (WDO)

7.1.2.1 The Waste Disposal Ordinance (WDO) prohibits any unauthorised disposal of wastes. Construction waste, defined under Cap. 354N of the WDO, refers to a substance, matter or thing which is generated from construction works. It includes all abandoned materials, whether processed or stockpiled or not, before being abandoned, but does not include sludge, screenings or matter removed or generated from desludging, desilting or dredging works.

7.1.2.2 Under the WDO, wastes can only be disposed of at designated waste disposal facilities licensed by Environmental Protection Department (EPD). Breach of this Ordinance can lead to a fine and/or imprisonment. The WDO also stipulates the requirements for issuing licenses for the collection and transportation of wastes.

7.1.3 Waste Disposal (Chemical Waste) (General) Regulation

7.1.3.1 Under the WDO, the Chemical Waste (General) Regulation provides regulations for chemical waste control, and administers the possession, storage, collection, transport and disposal of chemical wastes. EPD has also issued a 'guideline' document, the Code of Practice on the

Packaging, Labelling and Storage of Chemical Wastes (1992), which details how the Contractor should comply with the regulations on proper packaging, labelling and storage of chemical wastes.

7.1.4 Waste Disposal (Charges for Disposal of Construction Waste) Regulation

7.1.4.1 Under the Waste Disposal (Charges for Disposal of Construction Waste) Regulation, construction waste delivered to a landfill for disposal must not contain more than 50% by weight of inert material. Construction waste delivered to a sorting facility for disposal must contain more than 50% by weight of inert material, and construction waste delivered to a Public Fill Reception Facilities for disposal must consist entirely of inert material.

7.1.5 Land (Miscellaneous Provisions) Ordinance

7.1.5.1 The inert portion of construction and demolition (C&D) materials may be taken to public filling facilities including public filling area, public filling barging points and stockpiling areas. This ordinance requires Dumping Licenses (to be issued by Civil and Engineering Development Department (CEDD)) to be obtained by individuals or companies, who deliver inert C&D materials to the public filling facilities.

7.1.5.2 Individual licenses and windscreen stickers are issued for each vehicle involved. Public filling areas will accept only inert building debris, soil, rock and broken concrete. The material should, however, be free from marine mud, household refuse, plastic, metal, individual and chemical wastes, animal and vegetable matters and any other materials considered unsuitable by the Filling Supervisor.

7.1.6 Public Cleansing and Prevention of Nuisances Regulation

7.1.6.1 This regulation provides control on dumping or causing any litter or waste in public places. It also states the responsibility of premises occupiers to keep the surroundings clean, so as to prevent nuisances due to the cleanliness issue of the works sites.

7.1.7 Dumping at Sea Ordinance

7.1.7.1 According to the Dumping at Sea Ordinance, a permit from EPD is required if any waste producer intend to dump materials from vessels to designated marine dumping areas. The Authority will consider a number of factors including sources and nature of materials to be dumped, dumping rates, need for inspection / testing, water pollution avoidance measures etc. before determining whether such a permit would be granted and, where deemed necessary, any conditions to be complied with. Breach of the requirements in the permit would result in a fine and/or to imprisonment.

7.1.8 Other Relevant Guidelines

7.1.8.1 The following documents and guidelines in **Table 7.1** also relate to

waste management and disposal during construction:

Table 7.1 Other relevant documents and information

Bureau	Documents / Guidelines / Technical Circulars
Development Bureau	• WBTC No. 2/93, Public Dumps • WBTC No 2/93B, Public Filling Facilities • WBTC No. 16/96, Wet Soil in Public Dumps • WBTC Nos. 4/98 and 4/98A, Use of Public Fill in Reclamation and Earth Filling Project • WBTC No. 12/2000, Fill Management • WBTC No. 19/2001, Metallic Site Hoardings and Signboards • WBTC No. 12/2002, Specification Facilitating the Use of Recycled Aggregates • ADV-19, Practice Note for Authorized Persons and Registered Structural Engineers on Construction and Demolition Waste • ADV-21 Practice Note for Authorized Persons and Registered Structural Engineers on Management Framework for Disposal of Dredged/ Excavated Sediment • DEVB TCW No. 06/2010, Trip-ticket System for Disposal of Construction and Demolition Material • DEVB TCW No. 08/2010, Enhanced Specification for Site Cleanliness and Tidiness • DEVB TCW No. 09/2011, Enhanced Control Measures for Management of Public Fill • Project Administration Handbook (PAH) for Civil Engineering Works, Management of Construction/Demolition Materials including Rocks • A Guide to the Chemical Waste Control Scheme • A Guide to the Registration of Chemical Waste Producers

7.2 Description of the Environment

7.2.1 Existing Environment

7.2.1.1 As discussed in **Section 1** and illustrated in **Figure 1.1**, the proposed development for comprehensive residential and commercial development atop Siu Ho Wan Depot (SHD) is located on the deck to be constructed by another project. The deck would cover the existing SHD for essential maintenance works such as stabling tracks, workshops, and running / heavy maintenance facilities as well as infrastructure maintenance facilities.

7.2.2 Baseline Conditions

7.2.2.1 The site is currently being occupied by SHD. The major types of wastes generated from the existing SHD include industrial waste, chemical waste and general refuse.

7.2.2.2 The industrial wastes refers to the waste generated from the maintenance and repairing activities in SHD, which include scrap materials from rail and carriage maintenance, used fluorescent tubes, used welding rods, cleansing materials and discarded electronic equipment etc. These would be sorted on-site for further recycling or disposal. SHD is a registered Chemical Waste Producer and the chemical wastes generated would be temporarily stored in designated areas with bund wall before being collected by licensed chemical waste collector. For the general refuse, a waste collector is arranged to collect the general refuse daily from the depot.

7.3 Construction Phase

7.3.1.1 The topside development, the off-site utilities and the access roads would be implemented under the Project. The Siu Ho Wan Station and Siu Ho Wan Depot Replanning Works (SHO and SHD Replanning Works) will be separately implemented under another project (Railway EIA). In terms of construction of topside development, the following would be included in this project:

- Construction of podium and superstructure for Phase 1 to Phase 4 Development;
- Construction of a sewage pumping station at the eastern end of the proposed development;
- Construction of utilities between the sewage pumping station and Siu Ho Wan Sewage Treatment Works;
- Road improvement works at Sham Shui Kok Drive for the eastern connection access and road works at the western access via Tai Ho Interchange.

7.3.2 Assessment Methodology

7.3.2.1 The assessment of waste management implications from handling, storage, collection, transportation and disposal of solid waste materials generated by the landuse proposal have been undertaken in accordance with Annexes 7 and 15 of the EIAO-TM and the EIA Study Brief No. 294/2016.

7.3.2.2 The waste management hierarchy has been applied in the assessment and development of mitigation measures for waste. The waste management hierarchy is a concept which shows the desirability of various waste management methods and comprises the following in order of preference.

- Avoidance;
- Minimization;
- Recycling / reuse;

- Treatment; and
- Disposal.

7.3.2.3 The opportunities for reducing waste generation have been assessed based upon the following factors:

- avoiding or minimizing waste generation throughout design, construction and operational phase;
- adopting good management practices to promote segregation materials;
- reuse and recycling on-site or in other projects; and
- diverting inert C&D materials to public fills as far as possible.

Analysis of Activities and Waste Generation

7.3.2.4 The quantity, quality and timing of the waste arising as a result of the construction activities of the Project and its associated works have been estimated, based on the sequence and duration of these activities. The design, general layout, construction methods and programme to minimize the generation of C&D materials for the construction works have been considered.

7.3.2.5 The potential waste management implications associated with the handling, transportation and disposal of C&D materials, as well as chemical waste and general refuse arising from the construction works have been assessed with reference to the following approach:

- estimation of the types, timing and quantities of the C&D materials, chemical waste and general refuse to be generated; and
- assessment of the potential waste management implications on the capacity of collection, transfer and disposal facilities.

Proposal for Waste Management

7.3.2.6 Prior to considering the disposal options for various types of C&D materials, opportunities for reducing waste generated, on-site or off-site reuse and recycling have been evaluated. Measures which can be taken in the design phase (e.g. by modifying the design approach) and in the construction phase for maximising waste reduction have been separately considered.

7.3.2.7 After considering all the opportunities for reducing C&D materials generation and maximising reuse, the types and quantities of the remaining wastes required to be disposed of have been estimated and the disposal options for each type of wastes have been described. The disposal method recommended for each type of wastes has taken into account the result of the assessment.

7.3.2.8 The impacts caused by handling, collection, and reuse/disposal of C&D materials have been addressed and appropriate mitigation measures have been proposed. Also, proposed management procedure of

chemical waste (including labelling, packaging, storage and collection) and general refuse have been recommended.

7.3.3 Identification of Environment Impacts

7.3.3.1 During construction phase, the following activities would generate various types of C&D materials, general refuse and chemical waste. The waste management implication and recommend practices have been assessed and presented in the later sub-sections.

- Construction of podium and superstructures for Phase 1 – Phase 4 topside development;
- Construction of the sewage pumping station;
- Construction of utilities outside site boundary; and
- Road improvement works at Sham Shui Kok Drive for the Eastern connection access and road works at the western access via Tai Ho Interchange.

7.3.3.2 Temporary noise barrier for construction noise reduction have been suggested. It would be made of light-weight materials such as steel sheet or other absorptive fabrics, which are reusable after the Project. Hence it would not impose significant waste implication.

7.3.4 Prediction and Evaluation of Environmental Impact

7.3.4.1 The main activities which would potentially result in the generation of waste include construction of podium and superstructure for Phase 1 – 4 development, construction of sewage pumping station, utilities and access roads. As discussed in **Section 2.5**, SHD replanning works, construction of podium decking and property enabling works (including piling), SHO, and associated sewerage works would be covered by the Railway EIA.

7.3.4.2 A variety of different types of waste would be generated during the construction phase can be divided into the following distinct categories based on their composition:

- C&D materials from construction of podium and superstructures for Phase 1 – 4 development;
- C&D materials from the sewage pumping station works and utilities works;
- C&D materials from the road improvement works at Sham Shui Kok Drive for the eastern connection access and road works at the western access via Tai Ho Interchange;
- Chemical wastes from the above construction works; and
- General refuse.

7.3.4.3 As only superstructure construction and shallow excavation for sewage

pumping station, utilities and accesses are involved under this study, sediment would not be generated from the works assessed under this EIA. Instead, land-based sediment is anticipated for the foundation works to be conducted under the Railway EIA and the management of excavated sediment would be discussed in the Railway EIA.

7.3.4.4 The construction period of the proposed development will tentatively be from 2023 to 2037. The estimated amount of C&D materials to be generated during construction phase is summarised in **Table 7.2**.

Table 7.2 Estimated amount of different type of C&D materials to be generated during construction phase

Activities	Approximate quantity of C&D materials and waste to be generated (to the nearest hundred m^3)			
	Inert C&D Materials			Non-inert C&D Materials[4]
	Inert soft C&D Materials[2]	AHM[3]	Total	
Phase 1-4				
Construction of superstructures[1]	0	85,360 [5]	85,360 [5]	21,340
Access Road, Sewage Pumping Station and Utilities				
Construction of eastern connection access road	3,700	2,300	6,000	1,500
Construction of sewage pumping station and utilities	8,800	700	9,500	2,400
Total	12,500	88,360	100,860	25,240

Notes:

[1] The road works for the western access via Tai Ho Interchange would be included in the Phase 1 construction works.

[2] Inert soft C&D materials includes, but not limited to excavated soil, etc.

[3] Artificial Hard Materials (AHM) includes, but not limited to broken concrete, asphalt, bitumen and granular materials, etc.

[4] Non-inert C&D Materials includes, but not limited to, bamboo, timber, paper and plastic, etc.

[5] The amount is estimated based on a GFA of 1,067,000m^2 which includes all the residential blocks, commercial and retail facilities. With reference to the "Reduction of Construction Waste Final Report" (PolyU, 1993), a C&D materials generation rate of 0.1m^3 per 1m^2 of gross floor area (GFA) is adopted. A ratio of 2 : 8 for non-inert : inert C&D materials is adopted with reference to "Monitoring of Solid Waste in Hong Kong, 1997" by EPD. However, as the precast method would be adopted, the actual amount to be generated would likely be smaller than this estimated amount.

C&D Materials

Phase 1-4 - Construction of superstructures

7.3.4.5 For Phase 1-4, the construction of superstructure and the western access via Tai Ho Interchange would generate both inert and non-inert C&D materials.

7.3.4.6 The amount of inert C&D materials is estimated based on a GFA of 1,067,000m^2. With reference to the "Reduction of Construction Waste Final Report" (PolyU, 1993), a C&D materials generation rate of 0.1m^3 per 1m^2 of GFA is adopted. A ratio of 2 : 8 for non-inert : inert C&D materials is adopted with reference to "Monitoring of Solid Waste in Hong Kong, 1997" by EPD. Based on the calculation, it is estimated that 85,360m^3 of inert waste will be generated from the construction activities of the Phase 1 - 4 superstructure. However, as the precast method would be adopted, the actual amount to be generated would likely be smaller than this estimated amount. The inert C&D materials should be sorted out and reused on-site as much as practicable, and the surplus materials shall be delivered to public fill reception facilities for reuse in other projects.

7.3.4.7 It is estimated that in total, approximately 21,340m^3 of non-inert C&D materials would be generated and would be disposed of at the designated landfill site to be agreed with EPD/CEDD.

7.3.4.8 According to the current tentative construction programme, off-site disposal of inert and non-inert C&D materials generated from the construction activities for Phase 1 – 4 superstructure would be required between 2023 and 2037.

Construction of Eastern Connection Access on Sham Shui Kok Drive

7.3.4.9 A connection road will be constructed at Sham Shui Kok Drive, the eastern side of the Subject Site. The construction works will generate C&D materials, which mainly consist of inert C&D materials including inert soft C&D materials and AHM. Non-inert C&D materials is also anticipated.

7.3.4.10 For the eastern connection access, it is estimated that in total, approximately 3,700m^3 of inert soft C&D materials and 2,300m^3 of AHM would be generated. Since the major site formation works would have been completed when the construction works for the eastern connection access commence, the opportunity to reuse the inert C&D materials in the Project as fill materials is limited. Hence, they would be delivered to public fill facilities for reuse in other projects. 1,500m^3 of non-inert C&D materials would be generated and would be proposed to be disposed of at the designated landfill site to be agreed with EPD/CEDD.

7.3.4.11 According to the current tentative construction programme, off-site disposal of both inert and non-inert C&D materials would be required between 2036 and 2037.

Construction of Sewage Pumping Station and Utilities

7.3.4.12 A sewage pumping station will be constructed at the eastern portion of site boundary to facilitate the sewage from the proposed development to existing Siu Ho Wan Sewage Treatment Works (SHWSTW). The construction works will generate C&D materials including inert soft C&D materials and AHM. Non-inert C&D materials is also anticipated.

7.3.4.13 It is estimated that in total, approximately 8,800m^3 of inert soft C&D materials and 700m^3 of AHM would be generated, of which 1,600m^3 of inert soft C&D materials would be reused on-site. Other surplus inert C&D materials would be delivered to public fill facilities for reuse in other projects. 2,400m^3 of non-inert C&D materials would be generated and would be proposed to be disposed of at the designated landfill site to be agreed with EPD/CEDD.

7.3.4.14 According to the current tentative construction programme, off-site disposal of both inert and non-inert C&D materials would be required between 2023 and 2025.

Chemical Waste

7.3.4.15 Materials classified as chemical waste are listed in the Waste Disposal (Chemical Waste) (General) Regulation. The major chemical waste types arising from the construction sites may include the following:

- Scrap batteries;
- Spent hydraulic oil and waste fuel;
- Spent lubrication oil and cleaning fluids from mechanical machinery; and
- Spent solvent from equipment cleaning activities.

7.3.4.16 Chemical waste may pose the following potential environmental, health and safety hazards if not stored ad disposed of appropriately:

- Toxic effects to workers;
- Adverse effects on air, water and land from spills; and;
- Fire hazards.

7.3.4.17 It is difficult to quantify the amount of chemical wastes as it would be highly dependent on the Contractor's on-site maintenance practice and the quantities of plants and vehicles utilized. Nevertheless, it is anticipated that the quantity of chemical waste such as lubrication oil and solvent produced from equipment maintenance would be small and in the order of a few hundred litres per month.

7.3.4.18 Storage and handling of chemical waste should be arranged in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Waste published by the EPD. Chemical waste should be collected by a licensed collector and to be disposed of at a

licensed chemical waste treatment and disposal facility. Wherever possible, opportunities for the reuse and recycling of materials will be taken. Mitigation measures for chemical wastes are detailed in **Section 7.3.5**. Provided that the handling, storage and disposal of chemical wastes are in accordance with these requirements, adverse environmental impacts (including potential hazard, air and odour emissions, noise, wastewater discharge and public transport) are not expected.

General Refuse

7.3.4.19 The construction workers would generate refuse comprising food wastes, waste paper, aluminium cans and plastic bottles during construction period.

7.3.4.20 The improper storage of general refuse may give rise to adverse environmental impacts. These could include water quality, odour and visual impact; and in the form of windblown litter. The construction site may also attract pests and vermin if the storage areas are not well maintained and cleaned regularly. In addition, disposal of waste at sites other than the approved disposal facilities could also lead to similar adverse impacts at those sites.

7.3.4.21 The number of work force (clerical staff and workers) to be employed for the Project is around maximum 600 at the peak of construction period for Phase 1, Phase 2, Phase 3 and Phase 4 topside development while a maximum of 50 at the peak of construction for sewage pumping station, utilities and the eastern connection access. Based on the generation rate of 0.65kg/person/day, the total refuse generated per day (maximum) would be about 430kg/day. The estimated amount of general refuse generated during construction phase is summarized in **Table 7.3.**

Table 7.3 Summary of general refuse during construction phase

Phasing	Period	Max. No. of Work Force	Waste Generation Rate, kg/ person/ day	Daily Waste Generation, kg/ day	Duration, month	Total Amount Generated, Tonne [1]
Eastern connection access	October 2036 to December 2037	50 [2]	0.65	32.5	36	31
Sewage Pumping Station and utilities	July 2023 to March 2025					
Phase 1 [4]	October 2023 to September 2026	600 [3]	0.65	390	36	365
Phase 2	July 2027 to December 2029	600 [3]	0.65	390	30	305

Phasing	Period	Max. No. of Work Force	Waste Generation Rate, kg/ person/ day	Daily Waste Generation, kg/ day	Duration, month	Total Amount Generated, Tonne [1]
Phase 3	July 2031 to December 2033	600 [3]	0.65	390	30	305
Phase 4[5]	July 2032 to December 2037	600 [3]	0.65	390	54 [5]	548 [5]
				Total	**168 [6]**	**1,372 [6]**

Notes:

[1] Assume 26 working days per month.

[2] At any time, a maximum of 50 work force will be assumed during construction for eastern connection access, Sewage Pumping Station and utilities.

[3] At any time, a maximum of 600 work force will be assumed during construction for Phase 1, Phase 2, Phase 3 and Phase 4.

[4] The road works for the western access via Tai Ho Interchange would be included in the Phase 1 construction works.

[5] According to the tentative construction programme, there will be a 12-month period from Jul 2034 to Jun 2035 which no construction works for Phase 4 topside development would be conducted.

[6] Since there is a 18-month overlapping period between construction of Phase 3 and Phase 4 and the work force during the overlapping period would maintain at a maximum of 600 people, the total number of months and amount of general refuse generated during the whole construction period will not double count the 18 overlapping months.

7.3.4.22 In order to minimise the final disposal quantities of general refuse, provisions of recycle bins for different types of recyclable waste should be provided together with a general refuse bin. Arrangements should be made with the recycling companies to collect the recycle waste as required. The Contractor should provide training for workers relating to avoiding, reducing, reusing and recycling general waste. Participation in a local collection scheme should be considered by the Contractor to facilitate waste reduction.

7.3.4.23 Provided that the mitigation measures are adopted, the potential environmental impacts caused by the storage, handling transport and disposal of general refuse are expected to be minimal. It is recommended that general refuse should be collected on a daily basis for disposal. Mitigation measures to minimise potential environmental impacts are recommended in **Section 7.3.5**. With the proper implementation of the recommended mitigation measures, adverse environmental impacts (including potential hazard, air and odour emissions, noise, wastewater discharge and public transport) are not expected.

Transportation Routing and Frequency of Truck/ Vessels for Waste Disposal

7.3.4.24 It is estimated that 40 vehicles per hour at peak would be transporting C&D materials to or from the Subject Site to the disposal outlets. Upon

leaving the construction site, construction vehicles will enter the North Lantau Highway (NLH) westbound, turn around at Tung Chung Interchange and enter Tuen Mun- Chek Lap Kok (TM-CLK) Link, or enter the NLH eastbound and heading to Tsing Yi, and then to the respective disposal outlets. It is anticipated that construction vehicles would not enter the existing Tung Chung New Town and the planned extension. The transportation route is shown in **Appendix 7.1**.

7.3.4.25 No barging facilities and conveyor system would be provided for the Project. The inert and non-inert C&D materials would be delivered to designated public fill facilities and designated landfill respectively by trucks. Since the construction works for topside development are divided into phases and the works areas are relatively small, the amount of C&D materials to be generated daily is anticipated to be small. The materials will be reused or recycled on-site as much as practicable and any surplus would be timely transported out of site. Hence, no designated stockpiling area is planned within the Subject Site.

Construction Phase Waste Summary

7.3.4.26 In summary, the entire construction process of the construction works for Phase 1 – 4 developments, sewage pumping station, utilities and access road is estimated to generate a total of 100,860m^3 of inert C&D materials, which comprises 12,500m^3 inert soft C&D materials and 88,360m^3 AHM. Approximately 1,600m^3 of the inert soft C&D materials would be reused for backfilling the utilities works area. The remaining 10,900m^3 of inert soft materials and 88,360m^3 of AHM, which make up a total of 99,260m^3 inert materials, would be delivered to public fill reception facilities. Given that precast construction method is adopted and exploration of opportunities for reuse and recycle the C&D materials on-site, the disposal of inert materials would be further reduced.

7.3.4.27 Also, it is estimated that 25,240m^3 non-inert C&D materials, comprising bamboo, timber, paper and plastic, etc. would be generated from the construction activities. The non-inert C&D materials would be disposal of at the designated landfill to be agreed by EPD.

7.3.4.28 A summary of the C&D materials, chemical waste and general refuse arising from the works area with recommendation for outlets as well as the construction programme for each activity is presented in **Table 7.4**.

Table 7.4 Summary of waste arising with recommendation for outlets during construction phase

Activities	Waste Type		Total Amount Generated, m^3	Total Amount Reused, m^3	Total Amount Disposed, m^3	Recommended Outlets
Phase 1-4 (2023 –2037)						
Construction of superstructures[1]	Inert C&D materials	Inert soft C&D materials[2]	0	0	0	NA
		AHM[3]	85,360 [8]	[9]	85,360 [10]	Public fill facilities
		Total	85,360 [8]	[9]	85,360 [10]	Public fill facilities
	Non-inert C&D materials[4]		21,340	[9]	21,340	Designated Landfill
	General refuse[5]		1,341 tonnes [5]	[9]	1,341 tonnes [5]	Designated Landfill
	Chemical waste[7]		A few hundred litres per month	[9]	A few hundred litres per month	Chemical Waste Treatment Centre or other licensed facilities
Construction of Eastern Connection Access (2036 –2037)						
Construction of Eastern Connection Road	Inert C&D materials	Inert soft C&D materials[2]	3,700	[9]	3,700 [10]	Public fill facilities
		AHM[3]	2,300	[9]	2,300 [10]	Public fill facilities
		Total	6,000	[9]	6,000 [10]	Public fill facilities
	Non-inert C&D materials[4]		1,500	[9]	1,500	Designated Landfill
	General refuse[6]		31 tonnes [6]	[9]	31 tonnes [6]	Designated Landfill
	Chemical waste[7]		A few hundred litres per month	[9]	A few hundred litres per month	Chemical Waste Treatment Centre or other licensed facilities

Activities	Waste Type		Total Amount Generated, m^3	Total Amount Reused, m^3	Total Amount Disposed, m^3	Recommended Outlets
Construction of sewage pumping station and utilities (2023 –2025)						
Construction of sewage pumping station and utilities	Inert C&D materials	Inert soft C&D materials[1]	8,800	1,600	7,200	Public fill facilities
		AHM[3]	700	[9]	700 [10]	Public fill facilities
		Total	9,500	1,600	7,900	Public fill facilities
	Non-inert C&D materials[4]		2,400	[9]	2,400	Designated Landfill
	General refuse[6]		31 tonnes [6]	[9]	31 tonnes [6]	Designated Landfill
	Chemical waste[7]		A few hundred litres per month	[9]	A few hundred litres per month	Chemical Waste Treatment Centre or other licensed facilities
Whole Construction Process (2023 –2037)						
Construction works for Phase 1 – 4, sewage pumping station, utilities and access	Inert C&D materials	Inert soft C&D materials[2]	12,500	1,600	10,900 [10]	Public fill facilities
		AHM[3]	88,360 [8]	[9]	88,360 [10]	Public fill facilities
		Total	100,860 [8]	1,600	99,260 [10]	Public fill facilities
	Non-inert C&D materials[4]		25,240	[9]	25,240	Designated Landfill
	General refuse[5] [6]		1,372 tonnes	[9]	1,372 tonnes	Designated Landfill
	Chemical waste[7]		A few hundred litres per month	[9]	A few hundred litres per month	Chemical Waste Treatment Centre or other licensed facilities

Notes:

[1] The road works for the western access via Tai Ho Interchange would be included in the Phase 1 construction works.

[2] Inert soft C&D materials includes, but not limited to excavated soil, etc.

[3] Artificial Hard Materials (AHM) includes, but not limited to broken concrete, asphalt, bitumen and granular materials, etc.

[4] Non-inert C&D Materials includes, but not limited to, bamboo, timber, paper and plastic, etc.
[5] At any time, a maximum of 600 work force will be assumed during construction for Phase 1, Phase 2, Phase 3 and Phase 4.
[6] At any time, a maximum of 50 work force will be assumed during construction for eastern connection access, sewage pumping station and utilities. The figure indicates the total amount generated from the construction for eastern connection access, sewage pumping station and utilities.
[7] Chemical waste includes spent hydraulic oil and waste fuel, spent lubrication oil and cleaning fluids, spent solvent and scrap batteries.
[8] As the precast method would be adopted, the actual amount to be generated would likely be smaller than this estimated amount.
[9] C&D materials will be reused as far as practicable. The actual amount of materials to be reused is subjected to the actual site condition.
[10] The amount indicates the worst-case scenario assuming no reuse of inert C&D materials on-site. The actual amount to be disposed will be subject to the actual amount to be reused (Note 9)

7.3.5 Mitigation Measures

7.3.5.1 The mitigation measures for construction phase are recommended based on the waste management hierarchy principles. Recommendations of good site practices, waste reduction measures as well as the waste transportation, storage and collection are described below.

Good Site Practice

7.3.5.2 Adverse waste management implications are not expected, provided that good site practices are strictly implemented. The following good site practices are recommended throughout the construction activities:

- nomination of an approved personnel, such as a site manager, to be responsible for the implementation of good site practices, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site;
- training of site personnel in site cleanliness, appropriate waste management procedures and concepts of waste reduction, reuse and recycling;
- provision of sufficient waste disposal points and regular collection for disposal;
- imposition of penalty system on Contractors' improper behaviours when illegal dumping and landfilling outside their respective construction sites, i.e. on nearby farmlands and riverbanks, are reported;
- appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers;
- regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors; and
- the contractor should prepare a Waste Management Plan (WMP) in accordance with the ADV-19 Practice Note for Authorized Persons and Registered Structural Engineers on Construction and Demolition Waste. The WMP should be submitted to the Engineer for approval. Mitigation measures proposed in the EIA Report and the EM&A Manual should be adopted.

Waste Reduction Measures

7.3.5.3 Amount of waste generation can be significant reduced through good management and control. Waste reduction is best achieved at the planning and design phase, as well as by ensuring the implementation of good site practices. The following recommendations are proposed to achieve reduction:

- segregate and store different types of waste in different containers, skip or stockpiles to enhance reuse or recycling of materials and their proper disposal;
- proper storage and site practices to minimize the potential for damage and contamination of construction materials;
- plan and stock construction materials carefully to minimize amount of waste generated and avoid unnecessary generation of waste;
- sort out demolition debris and excavated materials from demolition works to recover reusable/recyclable portions (i.e. soil, broken concrete, metal etc.);
- provide training to workers on the importance of appropriate waste management procedures, including waste reduction, reuse and recycling.

7.3.5.4 In addition to the above measures, specific mitigation measures are recommended for the specific waste types so as to minimize environmental impacts during handling, transportation and disposal of waste.

Storage, Collection and Transportation of Waste

7.3.5.5 Storage of waste on site may induce adverse environmental implications if not properly managed. The following recommendation should be implemented to minimise the impacts:

- non-inert C&D materials and general refuse should be handled and stored well to ensure secure containment;
- no designated stockpiling area is planned as only relatively small amount of inert C&D materials (mainly hard materials) would be generated daily during the construction of superstructure, and the materials would be timely removed from the site. However, while pending for delivery, the material should be properly stored/ contained at appropriate place(s) subject to the future works plan of the Contractor. For dusty materials (excavated soil in utilities/ connection accesses construction), covers and water spraying mechanism should be provided to prevent materials from wind-blown or being washed away;
- different locations should be assigned for each material to enhance reuse. The temporary storage locations would need to be adjusted to suit actual site conditions.

7.3.5.6 The collection and transportation of waste from works area to respective disposal sites may also induce adverse environmental impacts if not properly managed. The following recommendation should be implemented to minimise the impacts:

- remove waste in timely manner;

- employ the trucks with cover or enclosed containers for waste transportation;
- obtain relevant waste disposal permits from the appropriate authorities; and
- disposal of waste should be done at licensed waste disposal facilities

7.3.5.7 In addition to the above measures, other specific mitigation measures on handling the excavated and C&D materials, chemical waste and general refuse generated from construction phase are recommended in the following subsections.

Excavated and C&D Materials

7.3.5.8 Wherever practicable, C&D materials should be segregated from other wastes to avoid contamination and ensure acceptability at Public Fill Reception Facilities areas or reclamation sites. The following mitigation measures should be implemented in handling the excavated and C&D materials:

- maintain temporary storage locations and reuse excavated fill material for backfilling if practicable;
- carry out on-site sorting;
- make provisions in the Contract documents to allow and promote the use of recycled aggregates where appropriate;
- implement a trip-ticket system for each works contract to ensure that the disposal of C&D materials are properly documented and verified;
- all dump trucks engaged on site to be equipped with GPS or equivalent system for tracking and monitoring of their travel routings and parking locations to prohibit illegal dumping and landfilling of C&D materials; and
- keep record and analysis of data collected by GPS or equivalent system relating to travel routings and parking locations of dump trucks engaged on site.

7.3.5.9 Details of the recommended on-site sorting and reuse of C&D materials is given below:

On-site Sorting of C&D Materials

7.3.5.10 All C&D materials arising from the construction would be sorted on-site to recover the inert C&D materials and reusable and recyclable materials prior to disposal off-site. Non-inert portion of C&D materials should also be reused whenever possible and be disposed of at landfills as a last resort.

7.3.5.11 The Contractor would be responsible for devising a system to work for on-site sorting of C&D materials and promptly remove all sorted and

processed material arising from the construction activities to minimise temporary stocking on-site. It is recommended that the system should include the identification of the source of generation, estimated quantity, arrangement for on-site sorting and/ or collection, temporary storage areas, and frequency of collection by recycling Contractors or frequency of removal off-site.

Reuse of C&D Materials

7.3.5.12 It is estimated that surplus C&D materials would be generated throughout the whole construction stage. The construction programme would be reviewed at a later stage to maximise the quantity of on-site reuse of surplus C&D materials whenever opportunity arises.

Specification of Inert C&D Materials to be Managed Off-site

7.3.5.13 In case the surplus inert C&D materials generated in the Project is required to be delivered to the public fill reception facilities, the inert C&D materials should fulfil the following requirements and those set out by the designated public fill reception facility:

- Reclaimed asphalt pavement will not be mixed with other materials when delivered to the public fill reception facilities;
- Moisture content of inert C&D materials will be lowered to 25% max. when delivered to the public fill reception facilities;
- Inert C&D materials delivered to the public fill reception facilities should be of a size less than 250mm; and
- Inert construction waste shall not be in liquid form such that it can be contained and delivered by dump truck instead of tanker truck. Inert C&D materials in liquid form shall be solidified before delivering to the public fill reception facilities.

Use of Standard Formwork and Planning of Construction Materials Purchasing

7.3.5.14 Standard formwork should also be used as far as practicable in order to minimise the arising of non-inert C&D materials. The use of more durable formwork (e.g. metal hoarding) or plastic facing should be encouraged in order to enhance the possibility of recycling. The purchasing of construction materials should be carefully planned in order to avoid over ordering and wastage.

Management of Land-based sediment

7.3.5.15 Land-based sediment would be involved in the foundation works and excavation works for the SHO and SHD Replanning Works. The sediment quality and estimated quantities of land-based sediment to be arisen from the SHO and SHD Replanning Works have been evaluated in the Railway EIA. From the results presented in the Railway EIA, approximately 21,826m^3 land-based sediment would be generated and would be disposed of at the designated marine disposal areas in

accordance with ADV-21 Practice Note for Authorized Persons and Registered Structural Engineers on Management Framework for Disposal of Dredged/ Excavated Sediment. Nonetheless, beneficial reuse of excavated sediment should be explored as far as practicable during the construction stage before the disposal of excavated sediment.

Chemical Waste

7.3.5.16 For those processes which generated chemical waste, it may be possible to find alternatives to eliminate the use of chemicals, to reduce the generation quantities or to select a chemical type of less impact on environment, health and safety as far as possible.

7.3.5.17 If chemical wastes are produced at the construction site, the Contractors should register with EPD as chemical waste producers. Chemical wastes should be stored in appropriate containers and collected by a licensed chemical waste contractor. Chemical wastes (e.g. spent lubricant oil) should be recycled at an appropriate facility as far as possible, while the chemical waste that cannot be recycled should be disposed of at either the CWTC, or another licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

General Refuse

7.3.5.18 General refuse should be stored in enclosed bins separately from construction and chemical wastes. Recycling bins should also be placed to encourage recycling. Preferably enclosed and covered areas should be provided for general refuse collection and routine cleaning for these areas should also be implemented to keep areas clean. A reputable waste collector should be employed to remove general refuse on a daily basis. It is expected that such arrangements would minimise potential environmental impacts.

7.3.6 Residual Environmental Impact

7.3.6.1 With the implementation of the recommended mitigation measures for the handling, transportation and disposal of the identified waste, adverse residual waste management implications are not anticipated for the construction phase.

7.4 Operational Phase

7.4.1 Assessment Methodology

7.4.1.1 The assessment of waste management implications have been undertaken in accordance with Annexes 7 and 15 of the EIAO-TM and the EIA Study Brief No. 294/2016. The waste management hierarchy comprising avoidance, mininisation, recycling/reuse, treatment and disposal has also been adopted for the assessment.

7.4.1.2 Prior to considering the disposal options for various types of wastes, opportunities for reducing waste generated, on-site or off-site reuse and recycling have been evaluated.

7.4.1.3 After considering all the opportunities for reducing waste generation and maximising reuse, the types and quantities of the remaining wastes required to be disposed of have been estimated and the disposal options for each type of wastes have been described. The disposal method recommended for each type of wastes has taken into account the result of the assessment.

7.4.1.4 The details of the assessment methodology could be referred to **Section 7.3.2.**

7.4.2 Identification of Environmental Impact

7.4.2.1 The operational phase of the proposed development would generate the following categories of wastes based on their composition:

- Municipal solid waste (MSW) from commercial and residential uses; and
- Chemical waste from the operation of the proposed ultimate SPS for topside development and school laboratory of educational institutions.

7.4.3 Prediction and Evaluation of Environmental Impact

Municipal Solid Waste

7.4.3.1 With reference to the latest data from "*Monitoring of Solid Waste in Hong Kong 2015*" by EPD, the MSW disposal rate was 1.39 kg/person/day in Year 2015, and the recovery rate for recycling was 35%.

7.4.3.2 Based on the targeted population, the tentative MSW to be disposed during operational phase has been estimated and is summarized in **Table 7.5** below.

Table 7.5 Estimated quantities of MSW during operational phase (to the nearest tonne)

Phases	Planned Population	Estimated MSW generation, tpd[1],[3]	Estimated MSW to be disposed, tpd[1],[3]	Estimated MSW to be recycled, tpd[2],[3]
Phase 1	9,439	20	13	7
Phase 2	8,435	18	12	6
Phase 3	9,110	20	13	7
Phase 4	10,816	23	15	8
Total	37,800	81	53	28

Notes:

[1] MSW disposal rate was 1.39 kg/person/day and 65% of the MSW generation according to "Monitoring of Solid Waste in Hong Kong 2015" by EPD (https://www.wastereduction.gov.hk/sites/default/files/msw2015.pdf). By calculation, the MSW generation rate was 2.14 kg/person/day.
[2] MSW recovery rate for recycling was 35% of the MSW generation according to "Monitoring of Solid Waste in Hong Kong 2015". By calculation, the MSW recycling rate was 0.75 kg/person/day.
[3] tpd: tonne per day.

7.4.3.3 This estimate assumed no further waste reduction measure to reduce the demand for valuable landfill space. However, based on information from EPD, the major components of MSW in Hong Kong included glass, metals, paper, plastics and putrescible. Most of these materials are recyclable which could considerably further reduce the amount for final disposal.

Waste Collection and Disposal

7.4.3.4 An effective and efficient waste handling system is essential in order to minimise potential adverse environmental impacts during waste storage, collection and transport, such impacts may include odour if waste is not collected frequently; water quality if waste enters storm water drains; aesthetics and vermin problems if the waste storage area is not well maintained and cleaned regularly. The waste handling system may also facilitate materials recovery and recycling.

7.4.3.5 The municipal waste generated from the residential and commercial uses would be transported to a refuse storage and material recovery chamber (RS&MRC). Waste separation provisions are recommended to be included in the RS&MRC. The waste could be sorted for materials recovery (such as paper and cardboards, plastics, metals and glass etc.) as far as possible. Different containers should be provided for the storage of different recyclable materials. The remaining waste would be collected and transported to refuse transfer station. To avoid potential odour nuisance to the residents during transport of waste, refuse collection vehicle with metal tailgate cover and waste water sump tank should be used and the collection route and time should be properly planned. At least daily collection should be arranged by the waste collector to collect the waste from the RS&MRC to the refuse transfer station.

Waste Recycling

7.4.3.6 In order to facilitate recycling, a 4-bin recycling system for paper, metals, plastics and glass should be adopted together with a general refuse bin. They should be placed in prominent places to promote waste separation at source. All recyclable materials should be collected by recyclers.

7.4.3.7 With reference to EPD's Waste Statistics for 2015, the recovery rate of MSW for recycling was 35%. It is anticipated that under full population intake scenario, 28 tpd out of 81 tpd of MSW would be recycled, leaving the remaining 53 tpd of MSW which would be disposed of to

landfill.

7.4.3.8 Nevertheless, with the implementation of mitigation measures described in **Section 7.4.4**, adverse environmental impacts (including potential hazard, air and odour emissions, noise, wastewater discharge and public transport) are not expected.

Chemical Waste

7.4.3.9 Educational institutions are planned within the proposed development and it is expected that chemical waste would be produced from the laboratories of these educational institutions during the operational phase. Also, operation of the proposed ultimate SPS for topside development may involve use of chemicals such as lubricant oil for maintenance.

7.4.3.10 It is anticipated that the total quantity of chemical waste such as acids, alkalis and organic solvent produced by school laboratories and proposed ultimate SPS for topside development would be insignificant.

7.4.3.11 To minimize potential environmental hazard due to waste handling, localized chemical waste storage areas should be located close to the source of waste generation for temporary storage. Drum-type containers with proper labelling should be used to collect chemical wastes for storage at the designated areas.

7.4.3.12 Registration as chemical waste producers with EPD should be made by representatives of the school prior to operation. All chemical wastes generated should be dealt with according to the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes under the provisions of the Waste Disposal (Chemical Waste) (General) Regulation.

7.4.3.13 During operation, chemicals such as detergents, fertilizers and pesticide may be occasionally involved in general cleansing and landscaping activities, subject to the future operation practices. Though the chemicals would be consumed and the residual quantity would not be significant to cause pollution or health risk, any chemical waste arising from these activities should be handled in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

7.4.3.14 With the implementation of mitigation measures described in **Section 7.4.4**, adverse environmental impacts (including potential hazard, air and odour emissions, noise, wastewater discharge and public transport) are not expected.

7.4.4 Mitigation Measures

7.4.4.1 The following measures should be implemented on topside developments to minimize the amount of municipal solid waste to be disposed of at landfill and to maximize the recovery of material from the waste stream.

Municipal Solid Waste

7.4.4.2 General refuse generated from the proposed development should be collected with lidded bins and delivered to a refuse storage and material recovery chamber and stored in enclosed containers to prevent windblown, vermin, water pollution and visual impact. At least daily collection should be arranged by the waste collector.

7.4.4.3 In addition, to facilitate recycling, a 4-bin recycling system for paper, metals, plastics and glass should be adopted together with a general refuse bin. They should be placed in prominent places to promote waste separation at source. All recyclable materials should be collected by recyclers.

Chemical Waste

7.4.4.4 To minimize potential environmental hazard due to waste handling, localized chemical waste storage areas should be located close to the source of waste generation for temporary storage. Drum-type containers with proper labelling should be used to collect chemical wastes for storage at the designated areas.

7.4.4.5 The producers should register with EPD as chemical waste producers. Chemical wastes should be stored in appropriate containers and collected by a licensed chemical waste collector. All chemical wastes generated from laboratories of educational institutions and the proposed ultimate SPS for topside development should be dealt with according to the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes under the provisions of the Waste Disposal (Chemical Waste) (General) Regulation.

7.4.4.6 It is recommended that the chemical wastes are disposed at a licensed waste disposal facility, such as the CWTC in Tsing Yi. A licensed collector should be employed for the chemical waste collection.

7.4.4.7 Collection receipts issued by the licensed collector showing the quantities and types of chemical waste taken off-site and trip-tickets showing the details of the chemical waste consignments should be kept for record.

7.4.5 Residual Environmental Impact

7.4.5.1 With the implementation of the recommended mitigation measures, adverse residual waste management implications are not anticipated for the operational phase.

7.5 Waste Management Implications Caused by Elements to be Implemented by SHO and SHD Replanning Works

7.5.1.1 As discussed in **Section 1.3**, the latest implementation strategy has recommended the following items in EIA Study Brief ESB-296/2016

will be separately implemented by the SHO and SHD Replanning Works project which will be addressed in the Railway EIA:

- Railway depot replanning works within the existing site boundary;
- Podium deck and property enabling works for the topside development;
- A new SHO and associated track works, as well as local access roads and emergency vehicular access (EVA); and
- Provision of the sewerage network with sewage pumping station to cater sewage generated by SHO and SHD Replanning Works.

7.5.1.2 According to the Railway EIA findings and recommendations, they have exhausted all the practicable measures to avoid, minimise and mitigate the generation of waste during both construction and operational phases. Railway EIA report has also recommended a series of mitigation measures similar to those as described in **Section 7.3.5** and **Section 7.4.4** of this EIA report for implementation. Railway EIA has concluded that, with the implementation of those mitigation measures, adverse residual waste management implications are not anticipated.

7.6 Conclusion

7.6.1 Construction Phase

7.6.1.1 Potential waste management implications from the generation of waste during the construction phase have been evaluated. Strategic mitigation measures, including the opportunity for on-site sorting, reusing C&D materials, etc., are devised to minimise the surplus materials to be disposed. Recommendations have been made for implementation by the Contractor during the construction period to minimise waste generation and off-site disposal. With the proper implementation of the recommended mitigation measures, adverse environmental impacts from waste management are not anticipated.

7.6.2 Operational Phase

7.6.2.1 The types of waste that would be generated during the operational phase have also been assessed. It is estimated that 81tpd of MSW will be generated during the operational phase where 28tpd of which will be recycled whilst the remaining 53tpd will require disposal. Recommendations have been made to ensure proper treatment and disposal of these wastes. With the proper implementation of the recommended mitigation measures, adverse environmental impacts from waste management are not anticipated.